106TH ANNUAL REPORT OF THE STATE GEOLOGIST

of

INDIANA GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES

for

July 1, 1981 - June 30, 1982

GEOLOGICAL SURVEY
ONE HUNDRED AND SIXTH ANNUAL REPORT OF THE STATE GEOLOGIST

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(From August 12, 1981)
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Christopher Schubert (USGS) . . . . . .Geological Assistant
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Laurie Sullivan . . . . . .Laboratory Assistant
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Maria Cantu . . . . . .Laboratory Assistant
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Melisa Friedl . . . . . .Laboratory Assistant
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Elizabeth Hardacre. . . . . .Laboratory Assistant
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Tim Laughlin. . . . . .Laboratory Assistant
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Jeanne Monday . . . . . .Laboratory Assistant
(May 12, 1982 to June 30, 1982)

Doug Opell (COM). . . . . Field Assistant
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Steve Owens . . . . . .Laboratory Assistant
(May 20, 1982 to June 30, 1982)
Susan Pappas. . . . . .Laboratory Assistant
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Stephanie Parker. . . . . .Laboratory Assistant
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Patricia Rayman . . . . . .Laboratory Assistant
(July 1, 1981 to July 21, 1981)
Ruth Ryan (COM) . . . . . .Laboratory Assistant
(June 1, 1982 to June 30, 1982)
Eric Silvers. . . . . .Laboratory Assistant
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Tom Skirvin (COM) . . . . . .Laboratory Assistant
(June 7, 1982 to June 30, 1982)
Patricia Sullivan . . . . . .Laboratory Assistant
(September 4, 1981 to May 7, 1982)
Timothy M. Sult . . . . . .Laboratory Assistant
(September 3, 1981 to April 28, 1982)
Lori Victory. . . . . .Laboratory Assistant
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Edith Wayman. . . . . .Laboratory Assistant
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Diane Wickware. . . . . .Laboratory Assistant
(January 19, 1982)
Christy Wrightsman. . . . . .Laboratory Assistant
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Dan Yoakum. . . . . .Laboratory Assistant
(February 2, 1982 to April 27, 1982)

Geology Section

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Steven Dean . . . . . .Laboratory Assistant
(June 29, 1982 to June 30, 1982)

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Laura Haynes. . . . . .Laboratory Assistant
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(July 1, 1981 to January 26, 1982)
Barry Lebowitz. . . . . .Laboratory Assistant
(May 10, 1982 to June 30, 1982)
Scott Lyford. . . . . .Laboratory Assistant
(July 1, 1981 to July 24, 1981)
Craig McCammack . . . . . .Laboratory Assistant
(September 1, 1981 to November 19, 1981)
Harriette Nesmith . . . . . .Laboratory Assistant
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Carol Ormond (SBH). . . . . .Laboratory Assistant
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Timothy O'Toole . . . . . .Laboratory Assistant
(September 14, 1981 to April 26, 1982)
Rosanne Parry (SBH) . . . . . .Laboratory Assistant
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Michele Wright. . . . . .Laboratory Assistant
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Geophysics Section

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Patricia Davis. . . . . .Research Assistant
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Patricia Fentress . . . . . Keypunch Operator
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Jeffrey Gardin. . . . . Keypunch Operator
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Robert Gjerswald. . . . . .Laboratory Assistant
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(September 22, 1981 to December 10, 1981)

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Harold Woodley. . . . . .Laboratory Assistant
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Petroleum Section

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(September 9, 1981 to November 2, 1981)
Gregory Brown . . . . . .Laboratory Assistant
(May 12, 1982 to June 30, 1982)
Jan Combs . . . . . Keypunch Operator
(July 1, 1981 to August 14, 1981)
Larry Enochs. . . . . .Geological Assistant
(May 24, 1982 to June 30, 1982)
Mary Feliciano. . . . . Keypunch Operator
(July 6, 1981 to August 17, 1981)
Becky Garges. . . . . .Laboratory Assistant
(July 1, 1981 to October 13, 1981)
Mike Hackman. . . . . .Laboratory Assistant
(May 10, 1982 to June 16, 1982)
Anna Marie Hamilton . . . . . .Laboratory Assistant
(July 2, 1981 to May 7, 1982)
William Hamm. . . . . .Laboratory Assistant
(September 3, 1981 to May 7, 1982)
Terry Legg. . . . . Keypunch Operator
(January 13, 1982 to April 22, 1982)
Cynthia Love. . . . . .Laboratory Assistant
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Tim Mallon. . . . . Keypunch Operator
(September 4, 1981 to September 24, 1981)
Myra McCotry. . . . . .Clerical Assistant
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Debbie Morris . . . . . Keypunch Operator
(September 10, 1981 to November 6, 1981)
Dianna Moss . . . . . .Clerical Assistant
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Evelyn Ogborn . . . . . Keypunch Operator
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Marti Rice. . . . . .Drafting Assistant
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(September 11, 1981 to February 4, 1982)
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(July 6, 1981 to August 4, 1981)
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Publications Section

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COAL AND INDUSTRIAL MINERALS

Introduction

Geologists of the Section answered 1236 requests for information from industry, citizens of Indiana and other states, and mineral professionals. This number is a 3 percent increase over the previous year. Section members conducted research on 42 projects, were officers in four professional organizations, and organized and conducted the major part of a large geologic conference.

Many requests were from industry representatives seeking information on quality and possible locations of commercial reserves of coal, limestone and dolomite, oil shale, sand and gravel, and other resources. We provided information and counsel to a major company that subsequently purchased large reserves of high-magnesium dolomite for making high-refractory bricks. We also provided data on high-brightness limestone to numerous companies, one of which began test drilling a reef containing high-calcium limestone for use as fillers and extenders. We continue to provide information, almost on a daily basis, to large and small coal companies concerning quality and reserves of Indiana coal in southwestern Indiana for surface and underground mining. The possibility of using the New Albany Shale in southeastern Indiana as a source of petroleum has prompted a large number of requests for information, and public talks by our geologists on the composition and geology of the shale has helped inform the public. Other inquiries this year were from private citizens requesting information on the amount and value of minerals on their property.

The Section's research on the above commodities generates information that is put to practical use nearly as fast as it becomes available. Our continuing collection of geologic data has taken a large step this year with the construction of maps showing the extent and locations of abandoned and active coal mines. This and other data on the mines are stored in computer files, which make data retrieval fast and simple. Our research included many aspects of the exploration for and production of coal and industrial minerals. Of particular value for research and resource evaluation is the information gained from test drilling with the Survey's drilling rig, one of the most useful research tools we have.

The professional activity of the members of the Section remained high this year. Geologists of the Section served in offices of professional organizations and organized and conducted a major part of The Forum on Geology of Industrial Minerals, a professional meeting convened in April in Bloomington and sponsored by the Geological Survey and the Department of Geology, Indiana University. More than 140 geologists from the United States and several foreign countries attended. Members of the Section presented 14 papers and posters at professional meetings and lectured at universities, public schools, symposiums, and public and other meetings. The results of their research were published in 24 papers or abstracts.

Research Projects in Progress

Clay and Shale

Several cores were described and sampled this year to continue our collection of detailed data on the shales of Indiana. Information obtained from analyses of different shales included clay-mineral composition, chemical composition, trace minerals, and carbon and sulfur isotopes. Ceramic analyses were received from the U.S. Bureau of Mines.

New Albany Shale (DOE funded)

An intensive 4-year study by the Survey of the petrology, mineralogy, stratigraphy, geomorphology, geochemistry, and physical properties of the New Albany Shale and equivalent strata in Indiana was completed this year, and a final report was published by the Survey.

Oil Shale prospects in southeastern Indiana (Indiana Department of Commerce)

Data were compiled to construct a map showing the thickness of overburden on the New Albany Shale in the 3-county study area, work was initiated on a bibliography for the New Albany, and an isopach map of the shale in the subsurface of Indiana was prepared.

Deep drilling program for coal

This project develops information on Indiana's deep coal resources, those that probably will be mined by underground methods. Through this project we are able to provide information on thickness, depth, quality, and reserves of coal; on properties of rocks associated with the coal for underground mining purposes; and the methane content of coal. This year we drilled two holes with partial funding by the U.S. Geological Survey: SDH-316 near Daggett in Owen County and SDH-317 near Staunton in Clay County.

Preliminary coal maps of Posey, Greene, and Owen Counties

These projects continue our county reconnaissance mapping of the distribution, structure, and mined areas of coal. Progress on the preliminary coal map of Owen County included added drilling data to our file from a number of test drillings. The compilation of maps showing mineable coals in Greene County are complete. Work maps and all of the final maps are compiled on the extent and structure of the coals and mining information for this county, and cross sections showing attitude of the coals have been completed. Some progress was made on coal maps for Posey County.

Coal resources of Gibson County

Work proceeded on several maps on the Springfield and Seelyville Coal Members. Several of the Springfield Coal maps were presented in a paper at a section meeting of the Geological Society of America.

Slurry ponds

A report to evaluate the resource potential of coal-mine preparation-plant refuse was expanded to include recovery of coal in gob piles. Sampling and analysis of samples was completed and a report was jointly prepared with the Geochemistry Section. An outstanding-paper award was received for a report given at a mining symposium, and the project was completed.

Coal resources of Vanderburgh County

Work continued on the examination of selected geophysical logs in the county and compilation of stratigraphic cross sections to evaluate the thickness and distribution of coals in Vanderburgh County.

Subsidence caused by underground mining of coal

A survey of subsidence detectable on aerial photographs and topographic maps was completed, and a report was published by the Survey dealing with the extent of underground mining in Indiana, methods of recognizing subsidence where it has already occurred, and the factors affecting subsidence.

Roof stability and geologic discontinuities in coal seams

The purpose of this project is to study and summarize the effects of geologic features on roof stability and the mineability of coal in underground mines. A report was completed on the effects of geologic features on mining conditions in an underground mine now active in Indiana; the geologic setting of the mine is representative of that in which a number of proposed mines would be located.

Coal resources of Vigo County

Data was compiled and maps were drawn showing the structure and thickness of major coals and rock intervals between coal beds. Writing was begun on a report on the coal geology and mining history of Vigo County.

Demethanization of coal

This study will determine the methane content of coal seams in Indiana using desorption methods developed by the U.S. Bureau of Mines. As cores of coal are drilled with the Survey's drilling rig, degassification of the coal is conducted.

Annual mine check

The directory of coal producers in Indiana was completed and published.

Indiana coal data system

Much of the activity for the project has now been merged with the project to enter point data into the National Coal Resources Data System (see below). Efforts on this project are focused on mapping coal-extent,

recording location of drill records and coal samples, and coding data sheets for drill holes and samples.

Point-source data for the National Coal Resources Data System (USGS funded)

Point-source coal data, including information from drilling records, coal samples, outcrop data, mine maps and records, and analytical data, were coded for entry into computer files. Maps showing extent of mines were also constructed and digitized for entry into the data system.

Geologic map of Indiana

Mapping of northern and southeastern Indiana for the bedrock geologic map was completed. Only mapping of formation contacts of rocks of Pennsylvanian age remain to be completed.

Maps of Indiana showing structure on top of the Muscatatuck Group and rocks of Silurian age

A map showing structure on top of the Muscatatuck Group was nearly completed.

Faulting in southwestern Indiana (NRC funded)

This 4-year project was completed, and a final report was written. Work in the final year included field work and mapping of the Mt. Carmel Fault in south-central Indiana and the drilling of two test holes to determine the northern end of the fault.

Faulting in mines of southwestern Indiana (NRC funded)

This project is an extension of the above study, and includes investigation of small-scale faulting and other displacement structures in surface mines of southwestern Indiana to help characterize the seismicity and determine the times of faulting in the area. Data from more than 50 mines were gathered to document stratigraphy, faulting, jointing, and other structures.

Silurian reefs in northern Indiana

A Survey drill hole was drilled in a thick reef in Pulaski County, and recording of structures and quality of rock in several known reefs were accomplished in this continuing study of reefs in northern Indiana. Industry evaluation of two reefs for high-calcium limestone continued this year.

Underground mining of limestone and dolomite in Indiana

Although not a formal project, we continue to develop information on underground mining for limestone and dolomite because of the industrial interest. A report on areas that have the greatest potential for underground mining for limestone and dolomite was completed and is scheduled for publication in the Transactions of the Society of Mining Engineers.

Carbonate rock fillers and whiting

About 700 samples have been tested to date, and several areas in Indiana have been found to contain high-brightness carbonate rocks. Tables of brightness and results of chemical analyses of all samples were compiled and entered onto punch cards for computer use. Two papers were prepared on the results of the project, and industry interest in the project remains high.

Tabulation of abandoned quarries

We continue to compile data on abandoned quarries in conjunction with other research and service duties. These files are regularly consulted for reclamation and mineral resource information.

Metal Deposits

A project to investigate the occurrence and origin of possible metal ore deposits in Indiana continued with analyses of water, shales, and other rocks by scanning electron microscopy, chemical analyses, and other methods to aid in the exploration for metals in Indiana. Industry interest in the project remained high.

Sources of construction materials in Indiana

This project reviewed the current sources of construction materials in Indiana and examined future sources. A paper on the subject was presented in April at the Eighteenth Forum on Geology of Industrial Minerals, and a report was prepared that will appear in the Proceedings.

Lake Michigan Sedimentation

Work was begun on a study of sediments along the south shore of Lake Michigan in conjunction with the U.S. Geological Survey. Cross-sections were prepared from data obtained during their drilling program, and samples collected during the drilling program are being analyzed for grain-size distributions.

Directory of sand and gravel producers of Indiana

Work was completed on the directory during the summer, and it was published in October of 1981.

Terrace deposits of the Eel River

Sand and gravel deposits along the Eel River were studied to determine their origin, extent, and suitability as an economic resource. Field and laboratory work were completed during the year, and a manuscript describing the deposits is being prepared. Some of the results of the study were presented at the annual meeting of the North Central Geological Society of America at West Lafayette.

Surficial geology of Vanderburgh County

The surficial geology of Vanderburgh County was studied emphasizing

the Quaternary geology of the Ohio River. Field work was completed during the year, and revisions to a draft manuscript describing the geology and the sand and gravel resources were begun. Some of the results of the study were presented at the annual meeting of the North Central Section of the Geological Society of America at West Lafayette.

Alluviation of the Middle Wabash River

Terrace deposits lining the valley walls of the Wabash River were studied in this project. Field work during the year concentrated on the terraces between Lafayette and Fort Wayne. Examination of numerous gravel pits along this stretch of the river, as well as along several of the major tributaries, were made during the course of the year. Some of the results of this work were presented at the Eighteenth Forum on Geology of Industrial Minerals at Bloomington and at the Geological Society of America meeting at Cincinnati. A manuscript describing the sand and gravel resources along parts of the river is in press, and a field trip guidebook describing the geology of the river in the Lafayette area was published.

Terrace deposits along the Whitewater River

Sand and gravel deposits along the Whitewater River were studied to determine their origin and relationship to the sand and gravel deposits of the Ohio River. Some of the results of this study were presented at the annual meeting of the North Central Section of the Geological Society of America, and a manuscript describing the sand and gravel resources was begun.

DRAFTING AND PHOTOGRAPHY SECTION

The primary function of the Drafting and Photography Section is to provide service to the commodity and research sections of the Geological Survey. The services consist mainly of the final preparation of maps and illustrations for publication, preparation of displays, mounting and framing of maps and photographs, phototypesetting, diazo printing, photocopying, film processing and printing, photomacrography, field photography, color proofing of maps and artwork, and preparation of projection slides.

Jobs completed for publication by the Geological Survey are: Special Report 22, Environmental Geology of Cass County, Indiana; Special Report 23, Environmental Geology of Grant County, Indiana; Special Report 24, The Salina Group (Middle and Upper Silurian) of Indiana; Special Report 25, Stratigraphy and Conodont Paleontology of the Sexton Creek Limestone and the Salamonie Dolomite (Silurian) in Northwestern Indiana; Special Report 26, Bedrock Geology and Mineral Resources in Putnam County, Indiana; Special Report 27, Mine Subsidence in Indiana; Special Report 28, A Fluvial Channel Contemporaneous with Deposition of the Springfield Coal Member (V), Petersburg Formation, Northern Warrick County, Indiana; Special Report 29, Fossils of the Dresbachian and Franconian (Cambrian) Age from the Subsurface of West-Central Indiana; Special Report 30, Environments of Deposition -- Coal Balls, Cuticular Shale, and Gray-Shale Floras in Fountain and Parke Counties, Indiana; Occasional Paper 36, Stratigraphy of the Ancell and Black River Groups (Ordovician) in Indiana; Occasional Paper

38, The Salem Limestone in the Indiana Building-Stone District; Mineral Economics Series 27, Oil Development and Production in Indiana During 1980; Directory of Coal Producers in Indiana; Directory of Dimension Stone Quarries in Indiana; Directory of Sand and Gravel Producers in Indiana; Petroleum Exploration Map 77, Well Location Map of Wells County, Indiana; Petroleum Exploration Map 77A, Map of Wells County, Indiana, Showing Total Depth of Wells; Petroleum Exploration Map 78, Well Location Map of Adams County, Indiana; Petroleum Exploration Map 78A, Well Location Map of Adams County, Indiana, Showing Total Depth of Wells; and revision of the petroleum exploration maps of Indiana counties.

Other jobs completed include revision of Miscellaneous Map 27, Map of Southwestern Indiana Showing Locations of Active Coal Mines; revision of a map showing published petroleum exploration maps of Indiana counties; 2 guidebooks for geologic field trips; illustrations for 10 outside publications; slide drawings for 17 talks; the artwork for a cover of a folder for the 18th Forum on the Geology of Industrial Minerals; and a logo for the 1983 Geological Society of America meeting in Indianapolis. Also completed are 3 poster displays for the 18th Forum on the Geology of Industrial Minerals, the 1981 Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation, and the Indiana Department of Commerce European Coal Trade Commission; displays for the 1981 Indiana State Fair and for the Newton-Stewart State Recreation Area Interpretive Center; and 3 sets of sketches for the newspaper series.

Other jobs in progress include Special Report 31, Environmental Geology of Vigo County, Indiana; Special Report __, Geology and Coal Deposits of the Clinton Area, West-Central Indiana; Miscellaneous Maps 35 and 36, Map of Indiana Showing Topography of the Bedrock Surface (scale 1:500,000); Miscellaneous Maps 37 and 38, Map of Indiana Showing Thickness of Unconsolidated Deposits; Miscellaneous Map __, Map of Indiana Showing Locations of Coal and Industrial Minerals Operations; and a display for the 1982 Indiana State Fair.

Photographic items produced consist of 1319 camera copies, 35 field and laboratory photographs, 7 photomacrographs, 9 photomicrographs, 1285 black and white prints, 368 film positives and duplicate negatives, 75 stripping film prints of stickup type and symbols, 19 scribesheets, 74 peelcoat films, 19 color proofs of maps and artwork for covers, 318 color slides, and 44 black and white slides.

Approximately 95,000 square feet of prints were produced on the diazo printer.

EDUCATIONAL SERVICES

The Office of Educational Services was established by the State Geologist to aid in the coordination of the Geological Survey's efforts in providing information about Indiana geology and mineral resources to the public. This office assists in the preparation of materials for newspapers, magazines, public schools, youth groups and adult groups, and all other groups and individuals who are interested in rocks, minerals, fossils, and the earth. On request, he participates in radio and television programs which involve something about Indiana geology,

minerals, etc. By means of news releases to Indiana's newspapers and articles sent to appropriate magazines, the Office of Educational Services not only aids in informing the public about the activities of the Indiana Geological Survey but also aids in the distribution of educational information to the public.

In addition to giving public lectures and conducting special field trips, when requested, the Educational Services geologist works directly with teachers in public schools, in college classes, with geology clubs, civic groups, rockhound clubs, Scout groups, 4-H clubs and adult leaders, conservation clubs and children and adults throughout the state on programs or projects concerning Indiana's geology and mineral resources. On occasion, when requested, he serves as guest lecturer and conducts special field trips for college classes. He identifies many of the rock, mineral, or fossil specimens sent through the mail or brought in to the Geological Survey by Indiana citizens and other visitors. The geologist in charge of Educational Services also aids in the preparation and installation of exhibits and displays for fairs, for professional meetings, for amateur rock shows, and for displays in the Geology Building. He also serves as judge of geology and weather exhibits at fairs, rock shows, etc.

During the 1981-82 fiscal year, the geologist in charge of Educational Services spent 26 1/2 days in the field and traveled more than 6,000 miles. In answer to requests received from the public, he gave 24 public lectures and conducted 4 educational field trips and 9 tours of the Geology Building during the 12 month period.

During the past fiscal year, he continued the program for providing illustrated news items for Indiana's newspapers and, with the assistance of Survey personnel and the Survey artist, added 18 additional units to the series and mailed them to all newspapers throughout the state. The total number of the series currently is 156 and another 12 units are in process.

Public lectures were made to the following groups: Boy Scout Troop 95 at Brazil, Indiana; 7th and 8th grade classes of Greencastle Jr. High School (annual outing); enrichment program group at Princeton Middle School; 7th and 8th grade classes of Edgewood Jr. High School, Ellettsville; and groups of Girl Scouts attending the annual Monroe County Girl Scout Day camp at Cascades Park, Bloomington.

He also conducted special field trips (educational) and collecting field trips for the following groups: science students from Pike High School, Marion County (2 trips); a geology class from Manchester College, North Manchester; and was an assistant on one of the pre-conference field trips for the Forum on Geology of Industrial Minerals.

The Educational Services geologist again served as the Geological Survey's representative on the Department of Natural Resources State Fair Committee for the 1981 Indiana State Fair.

He conducted tours of the Geology Building for the following groups: members of a science class from Shawswick School, Lawrence County; a group of geology students and their professor from Dennison University, Ohio; members of the Evansville Lapidary Society's Junior Rock Club; members of the Rogers School Cub Scout pack, Bloomington; members of the Arlington

Heights School Cub Scout pack, Bloomington; members of an economic geology class, IUPU-Fort Wayne; a visiting geologist from Argentina; and a visiting family from Indianapolis.

Articles submitted by Survey personnel and published in OUTDOOR INDIANA during the past fiscal year included: "Salem Limestone--No. 1 for Building," by R. Dee Rarick (July-August 1981); "Coal Mine Subsidence in Indiana," by Denver Harper (October 1981); "Hoosier Mineral Resources: Products of Ancient Geologic Processes," by R. Dee Rarick (November 1981); "Indiana's Gypsum," by R. Dee Rarick (February 1982); "Callixylon: 375-million-year-old Fossilized Wood in Indiana," by R. Dee Rarick (March 1982) and "Geology's Homemade Earthquakes," by Maurice E. Biggs and R. Dee Rarick (April 1982).

Exhibits prepared by and installed by the Indiana Geological Survey for public display included an exhibit about Indiana's building-limestone industry for the 1981 Indiana State Fair. This exhibit was later put on display for several weeks at the Monroe County Historical Society Museum in Bloomington. The Trenton Field exhibit was installed at the I.U. Assembly Hall for the 1982 Campus-Community Fair. A new exhibit about the geology of the Patoka Lake area was prepared and installed at the Visitor's Center at the Patoka Lake State Recreational Area. After refurbishing the Survey exhibit at the Nature Center at Spring Mill State Park, another panel showing scenes of activity in Indiana's building-limestone industry was added to this exhibit. The existing Trenton Field exhibit was taken to the annual outing of the Illinois Oil and Gas Association at Rend Lake, Illinois.

During the past fiscal year, the Educational Services geologist submitted 3 news releases about Geological Survey activities and the availability of new Survey maps and publications; during the 1981 4-H Fair season, judged 4-H geology and weather exhibits for the Martin County 4-H Fair, the Jefferson County 4-H Fair, and the Jennings County 4-H Fair; compiled three editions of the Survey Newsletter and distributed them to all Survey personnel; and on March 12, 1982, was a guest on the Department of Natural Resources' television show "Indiana Outdoors". He was interviewed about Indiana's standing rocks.

GEOCHEMISTRY SECTION

Samples collected by all sections of the Geological Survey are analyzed by the Geochemistry Section to determine their chemical and mineralogic composition. Analyses mainly are made by x-ray, spectrometric, or other instrumental methods, but standard wet chemical methods also are used.

The coal chemistry laboratory received 61 samples of waste material from coal preparation. This material yielded 1,145 quantitative determinations, 719 determinations of sulfur, and 659 determinations of carbon dioxide. This work was the basis for a report on the energy content and geochemistry of preparation plant wastes in the Green Valley - Wabash Mine in Vigo County.

In the spectrographic laboratory, 128 samples were run by emission

spectrograph to obtain 1,546 determinations, x-ray diffraction patterns were run on 9 samples, and 1,981 samples were analyzed on the CHN (carbon, hydrogen, nitrogen) equipment to obtain 3,343 determinations. The inductively coupled plasma atomic emission spectrometer was used to analyze 115 samples, mainly of shale, to obtain 1,794 determinations.

In miscellaneous activities, the section worked with the U.S. Geological Survey to include Indiana's analyses of the geochemistry of water into a data bank and to obtain access to the total file of analytical data on water in the U.S.G.S.'s data bank. Forty-nine samples and 9 standards were run on leachate in connection with the Hazardous Waste project to determine arsenic and selenium. A large backlog of several tons of core samples has now been reduced to a manageable size and the residue discarded.

GEOLOGY SECTION

The Geology Section is charged with a prime responsibility to collect, interpret, store, and disseminate basic information on the nature and distribution of the rock materials in the earth's crust at and below the surface of the State of Indiana. Considering the geology that is peculiar to Indiana, this charge means that the Section is oriented fundamentally in stratigraphy, including Quaternary stratigraphy, and paleontology. Synthesis of collected information in a framework of geologic time, therefore, is the task of the Section that perhaps expresses best the purest form of scientific research that it carries on.

Particularly in its responsibility to disseminate information, however, the Section's activities become very practical. Probably the most basic of the practical tasks carried on is mapping, and one of the Section's longest enduring (20 to 25 years) major efforts has been devoted to statewide mapping of unconsolidated and consolidated materials alike. Mapping may be considered as a chronologically ordered statement of the nature and distribution of rock materials at and near the surface in Indiana.

The most applied of the Section's practical activities are those conducted as direct responses to public, industrial, business, educational, governmental, and professional needs. Many of these applied activities are characterized as educational and environmental.

Mapping is noted above as one activity that spans well the functions of the Section that range in nature from research to applied. Another such activity is carried on in the sedimentation laboratory, wherein 3,778 separate analyses and tests were performed during 1981-82. These analyses and tests are of about 10 different kinds and the results are applicable equally to practical studies (e.g., environmental geology reports requeted by regional planning groups) and to purely research-oriented studies (e.g., Quaternary history of the buried Teays Valley in Indiana). Also, some analyses are performed for other, mostly Survey geologists, which is an example of what is meant above by "professional needs".

During the year, the Section listed nine separately designated formal projects, one being a new project and none being completed. Among these,

three are more or less practically oriented, including one geographically defined environmental geology project, one mapping project, and one problem-oriented environmental project.

Two other projects that are data-gathering projects (Characteristics of Indiana Tills and Engineering Properties of Unconsolidated Deposits) were not listed in the reports, but they were carried on largely through the work done in the sedimentation laboratory and they were drawn upon by other projects.

Bedrock geology map of Indiana

This project, begun in 1978-79, is to produce a single-sheet map at a scale of 1:500,000 showing pre-Quaternary deposits. It will use and update the information appearing on the eight 1^{o} x 2^{o} Regional Geologic Maps. Also, it will be the first map of this kind at the stated scale. The project neared completion during 1981-82. This adjunct also is noted as a 1981-82 activity: Map of Indiana showing thickness of unconsolidted deposits was submitted for publication.

This adjunct of the project was submitted in 1980-81 but remained unpublished: Map of Indiana showing topography of the bedrock surface. A further byproduct is a published abstract on ice-marginal drainage patterns in southwestern Indiana.

Middle Paleozoic geology of northern Indiana

This is a long-standing project (since 1966) that embraces basic stratigraphic and paleontologic studies of particularly Silurian and Devonian rocks in an ara where little subsurface work on these rocks had been done. It originally had support from the National Science Foundation and has continued to result in a number of yearly reports and in some application to the state mapping program and environmental projects.

During 1981-82, three principal reports and one abstract were published: Special Report on the Salina Group; Special Report on Sexton Creek and Salamonie biostratigraphy; and guidebook and an abstract on Silurian reefs. Another principal report (on Silurian reefs near Celina, Ohio) was submitted for publication.

COSUNA-LOBAR project

This project (Correlation of Stratigraphic Units of North America, Lowland Basins and Arches Region) was described in some detail in the 1980-81 report. The principal product, a chart consisting of 29 columns for eight states and coordinating literally thousands of rock-stratrigraphic and chronostratigraphic names, was submitted for publication to the American Association of Petroleum Geologists during 1980-81. It remained unpublished.

The second and final main phase of this project consists of preparation of about 3,000 data sheets, one for each appearance of the rock-stratigraphic names. This phase was nearly completed during 1981-82.

Quaternary stratigraphy

The three projects listed in this emphasis have been described in earlier annual reports: (1) Tills of Northwest Indiana (begun in 1971), (2) Pleistocene Stratigraphy of West-Central Indiana (begun in 1968), and (3) Teays Valley of Indiana (begun in 1976). They are designed to provide a better understanding of the nature and chronologies of tills in the Valparaiso Moraine and in the area of merger of tills derived from the Lake Michigan and Lake Erie glacial lobes in western Indiana; also, a first understanding of the tills and other materials that fill the major pre-Quaternary valley system that crosses northern Indiana. The Teays project also forms a basis for the project on ground water that is found in the Teays system, a project that is carried on by the Division of Water.

The project numbered 1 above remained essentially inactive. Projects 2 and 3 were advanced by both field and laboratory studies. Also, a newly prepared map on detailed bedrock topography of the Teays Valley was submitted for publication, and two abstracts on glaciofluvial sedimentation in the Wabash Valley and Trafalgar glaciation were published.

In relation to these and other projects, prior to 1981-82 we submitted the materials needed for the Indiana portion of a new Quaternary geology map of the United States (U.S. Geological Survey), but this map remained unpublished.

Hazardous waste disposal

The purpose and sponsorship of this project, which was begun in 1979-80, were detailed in the 1980-81 report. Very nearly all the considerable field and laboratory work planned for this project was completed in 1981-82. Eight interim reports (based on eight maps and chapters) were planned as separate submissions to the State Board of Health. When all eight interim reports are finished, they are to be assembled into a whole for publication by the State Board of Health. During 1981-82, two of these reports, for the areas covered by the Muncie and Fort Wayne maps, were submitted to the State Board of Health. The remaining six were nearly completed.

County environmental reports

Two county reports in this long-standing and often-described program were published, those for Grant and Cass Counties. Two other county reports, Vigo County and Putnam County, were submitted prior to 1981-82 but remained unpublished. An environmental report on a fifth county, Starke, was prepared and submitted to a State planning office. This report is to be fleshed out and eventually published.

The long-standing project on environmental geology of Monroe County remained inactive.

GSA 1983 field trips

The Geological Society of America will meet in Indianapolis in 1983, the Geological Survey being one of the four cohosts. The management of all the field trips was placed in the Geology Section, and five Section geologists have been designated as leaders for six of an overall 17 trips:

(1) glaciofluvial sedimentation, Wabash Valley; (2) glacial stratigraphy, Peoria, Illinois, to Indianapolis; (3) archaeological geology, Wyandotte Cave area; (4) urban and engineering geology, Indianapolis area; (5) Paleozoic unconformities, southern Indiana and adjacent Kentucky; and (6) Silurian reefs and other rocks as responses to cyclical environments, northern Indiana and adjacent states. All the required effort is lodged in one formal project for reporting purposes.

In 1981-82 much of the overal planning (17 trips) was accomplished, and the field work was begun.

Biostratigraphic and other paleontologically based studies

Most notably, the Section was asked to date certain Ordovician rocks, the newly recognized subsurface Everton Dolomite in far southwestern Indiana and Lower to Middle Ordovician rocks associated with hydrocarbon production from the old Trenton Field. The Everton conodont report was submitted for publication as an Occasional Paper. An old manuscript on Trenton and Lexington conodont biostratigraphy of southeastern Indiana was reactivated as another response to the request for the Section to undertake Ordovician conodont studies.

A study of Vienna (Chesterian) conodonts was published. It resulted from Rexroad's activities as an adjunct professor in Indiana University and involved an undergraduate honors student. Still another Chesterian conodont study remained unpublished, although it was submitted during 1980-81.

A published abstract and a submitted full paper on Atokan (lower Middle Pennsylvanian) bio- and chronostratigraphy of the Illinois Basin and the Midcontinent area resulted from temporary reactivation of an old project on Pennsylvanian ostracods of Indiana.

The Section sponsored the newly published Special Report 29 on Upper Cambrian trilobites from wells in western Indiana. This report had been suggested by the Petroleum Section in connection with its study of pre-Knox stratigraphy. The Section also sponsored the newly published Occasional Paper on the Ancell and Black River Groups (Middle Ordovician) of Indiana.

Miscellaneous Activities

The Section completed six special (unpublished) reports that had been requested by professional, business, State-planning, State-governmental, and private-citizen groups. The three that have not been singled out above in relation to formal environmental projects deal with a Lawrence County landfill, Silurian reefs of Ohio and Indiana, and an erosion problem at New Harmony.

The Section completed 100 questionnaires on geology and mineral resources pertinent mostly to road, street, and bridge improvement, replacement, and construction throughout the state. These were requested by governmental agencies and construction companies. This volume is down from last year by one-sixth.

The Section recorded 577 conferences (includes 70 in the field) of

note and 498 and 895 pieces of first class mail in and out, respectively. The majority of these relate directly to requests for geologic information or service, and they run the gamut of applied and research activities and of kinds of respondents noted above under "FUNCTION".

Members of the Section conducted six field trips, two of which were for professional petroleum geologists, three for professional society groups, and one for an educational group.

Members of the Section made 16 formal oral presentations, of which 8 were to professional society groups, 1 to another kind of professional group, 5 to educational groups, and 2 to church groups.

As recorded by 34 items in Exhibit H, members of the section served on various committees, attended specified professional meetings, served as reviewers, and carried on yet other activities not recorded in the other exhibits.

GEOPHYSICS SECTION

During the 1981-82 fiscal year the Geophysics Section continued to maintain a program of field work, laboratory measurements of physical properties, and development of computer programs to assist in the interpretation of geophysical data. The Geophysics Section also was responsible for the operation of the Survey's drilling program and equipment.

A geophysics field crew established gravity base stations throughout central and northern Indiana. The base station network is being established with great care so that all Indiana gravity stations are in precise agreement with each other, and as much as possible with base stations in other states. This network is to serve as a reliable starting point for regional gravity surveys and as a basis for providing absolute values of gravity for specific purposes such as mineral surveys and national defense applications.

The crew also ran seismic refraction surveys in August, September, and October. These surveys were run at the request of the Divison of Water, which with the U.S. Geological Survey is preparing a report on the groundwater resources of areas in Lagrange, Elkhart, and Kosciusko Counties, and also in connection with a water supply problem in Ripley county. Seismic shots were made at locations for which well information is not available in order to determine the thickness of unconsolidated material above bedrock.

In the laboratory, raw data from the field surveys were computed, plotted, and the results sent to the interested persons. Work also continued on determining physical properties of Indiana rocks. Particular effort was applied to testing how the Salem Limestone (building stone) fails under stress with different types of anchor bolts.

PETROLEUM SECTION

Members of the Petroleum Section are occupied with duties which fit into five general categories: (1) services to the public, (2) projects which are performed annually, (3) projects related to records maintenance and improvement, (4) projects involving the study of the subsurface stratigraphy of Indiana, and (5) special projects which arise due to a special need or request.

Services

The services performed by the Petroleum Section for the public consisted of conferences, requests for availability of information, correspondence, and interpreations made from subsurface well information. Visitors to the section seeking information in one form or another numbered 502, up from the 386 visitors of a year ago. In addition to the visitors, requests for subsurface information are received daily by telephone or correspondence.

Annual Projects

Indiana Drilling Statistics -- Drilling statistics were compiled for wells drilled in Indiana during the year. These statistics comprise a part of the nationwide totals compiled by the American Association of Petroleum Geologists and the American Petroleum Institute.

Indiana Exploration Development -- An annual review of exploration activity in the state was compiled for inclusion in the Bulletin of the American Association of Petroleum Geologists.

Indiana Oil Production -- Preparation of the annual oil production statistics by fields in the Geological Survey's Mineral Economic Series was completed.

Indiana Oil Reserves -- Reserves statistics for Indiana's oil fields were prepared and maintained as a part of the information file on Indiana's oil industry.

Indiana's Potential Gas Supply -- Preparation of statistics for the undiscovered potential gas supply in Indiana was completed and submitted to the Potential Gas Committee for inclusion as part of national statistics compiled by that committee.

Review of Petroleum Exploration Map Series -- The individual county petroleum map transparencies were updated at year's end. Forty-eight maps were revised, two new maps were published, and fifty-six were checked with no revision necessary.

Records Improvement

Trenton Field Wells Record -- Continued effort was spent in evaluation, acquisition, and preparation of miscellaneous well records for inclusion in the master file of well information. A search of the well files of the Division of Oil and Gas in Indianapolis was made and data not in the Survey's files were borrowed for reproduction. Records evaluation

was conducted in Adams, Blackford, Delaware, Huntington, Jay, and Wells Counties during the year.

Microfilming of Master File Well Data -- Filming of the Section's master well data file was completed during the year and a microfiche reader and microfiche for well records in 31 counties in Indiana were received during the year. A continuing process of filming records of newly drilled wells provides a current record of well data. Both the reader and the microfiche cards are provided at no charge to the Geological Survey by Petroleum Information Corporation of Denver.

New Petroleum Exploration Maps -- New petroleum exploration maps for Adams and Wells Counties were prepared from well data which has been upgraded in quality. The maps replaced the old preliminary maps for those counties, giving a much higher assurance of accuracy for the information shown.

Subsurface Studies

Oilfield Brines of Indiana -- Progress was made by Stanley Keller on the compilation of analyses of the composition of oilfield brines taken from various stratigraphic units from different localities throughout Indiana. Completion of the compilation is expected to result in an occasional paper covering analyses of all of the available oilfield brines in the state.

Natural Gas in Indiana -- Due to the press of other duties, little progress has been made during the year by Dan Sullivan on a report dealing with the natural gas fields of Indiana. Work on the project is expected to resume soon, however.

Geology of the Trenton Field in Indiana -- As part of an on-going study of the geology of the Trenton Field, Brian Keith collected some brines from the Trenton Limestone from wells newly drilled in the Peru oilfield in Miami County. Also collected from the same source were samples of oil from the Trenton reservoir. Analyses of these samples are to be preserved as comparative material for samples which may be obtained from within limits of the Trenton Field. Cores of the Trenton Limestone from a well in the Peru Field were also obtained and analyses of porosity, permeability, and fluid contents were obtained as an aid in the study of the Trenton Field. Preparation of a state-wide isopach map of the Trenton Limestone is underway by Brian as a part of the overall Trenton project.

Pennsylvanian-Mississippian Unconformity Map -- Stanley Keller is preparing a map of Indiana showing the stratigraphic units in contact at the unconformity between the Pennsylvanian and Mississippian Systems in Indiana. Completion of the project is to result in publication of a map of the state on a scale of 1:500,000 as a part of the Miscellaneous Map Series.

Special Projects

Geology of the New Madrid Area -- Dan Sullivan completed his participation as co-principal investigator of a project to study the geology and extent of faulting in the New Madrid seismic area, a 200-mile

radius which includes part of southwestern Indiana. A final report covering the investigation was prepared and submitted to the Nuclear Regulatory Commission, under whose sponsorship the investigation was conducted.

Reproduction of Well Data -- Additional part-time hourly employment was added along with an increase in the price of wire-line logs in order to reduce demands on secretarial responsiblities in providing copies of well data in response to requests made of the Petroleum Section.

News Media Interviews -- Brian Keith participated in a taped television interview held by the I.U. News Bureau for WANE-TV of Fort Wayne concerning leasing and drilling activity in the Trenton Field. Various members of Petroleum Section staff have particpated in telephone and personal interviews with various newspapers concerning leasing and drilling activity in various parts of Indiana.

Compressed Energy Storage in Indiana -- Brian Keith prepared data on the potential for compressed energy storage in Indiana in response to a request by the Electric Power Research Institute. The Institute was preparing a manual covering a multi-state area concerning the potential for storing compressed air in hard rock caverns, salt domes, and aquifers.

PUBLICATIONS SECTION

During the past fiscal year the Publications Section sold 10,799 reports and 21,426 maps. The section sent 3,238 reports and 134 maps on exchange to institutions in the United States and in foreign countries. It also distributed without charge 3,267 reports and 1,647 maps to members of its own organization and to individuals, libraries, and companies in the United States and abroad. The Publications Section served 6,008 office customers, handled 4,599 letters pertaining to geologic reports and maps, and sent out 1,307 announcements of new publications.

Seventeen reports, four new maps, and 66 revised maps were issued during the fiscal year, and two reports and five maps were reprinted. Six manuscripts of Survey reports, 37 abstracts, and 33 manuscripts prepared by Survey personnel for outside publication, and 12 news releases, newsletters, exhibits, and similar material were edited during the fiscal year. Eighteen news releases, "Our Hoosier State Beneath Us," were also edited, and camera copy for them and for 36 miscellaneous projects was prepared.

New equipment in the Publications Section was a Sharp Compet QS-1183 electronic printing calculator.

MINERAL STATISTICIAN

As production figures for minerals are reported largely on a calendar year basis by producers, and are so tallied by the Indiana Geological Survey, the U. S. Bureau of Mines, and other agencies that collect and compile such data, this report covers calendar 1981.

Because of the huge amount of coal produced in Indiana, and a somewhat increased unit price, the total mineral industries value, at first stage of salability, declined only .52 percent in 1981 from the previous year -- from $996,591,430.00 to $991,409,816.00 The manufacture of cement and clay products, and the processing of limestone for dimension purposes, contributed more than an additional $90,000,000.00 to the value of the minerals produced in Indiana, for a total value of nearly 1.1 billion dollars. The value of the mineral industries in the state was further increased by several millions of dollars through the production of lime, the recovery of sulfur, and the processing of perlite, all from materials imported largely from out-of-state.

The fuels -- coal, petroleum, and natural gas -- accounted for 85.84 percent of the total value, and coal alone accounted for 68.15 percent. Although coal mining was carried out in 16 counties, a little more than half of the coal produced came from Pike and Warrick Counties. According to U. S. Department of Energy figures, the average price per ton in Indiana was $23.18 as compared to $26.40, the United States average price.

After three years of steadily increasing oil production, a decline of some 256,000 barrels, or 3.14 percent, occurred in 1981, but oil continues as the state's second most valuable mineral commodity. Rapidly escalating prices of natural gas resulted in a total increase in value of 82.6 percent, although production dropped 23 percent from the previous year.

The severely depressed economy was reflected in the decreased production of materials used in the construction industry. Crushed limestone, sand and gravel, gypsum, dimension limestone, and clay and shale production declined in amounts ranging from 12.09 to 23.93 percent in quantity and 8.05 to 19.91 percent in total value.

Because of the decision by the U. S. Bureau of Mines, with whom we have a cooperative agreement for the collection of mineral statistics, to canvass the crushed stone industry and the sand and gravel industry in alternate years, beginning with 1981 figures, it became necessary for us to conduct our own canvass in order to have as complete information as possible. A very simple questionnaire was designed in order to place the least possible burden on the companies. Response by the companies was fairly good.

The following counties led in production of minerals (exclusive of oil and gas):

County	Value at first stage of salability	Mineral Commodity (in alphabetical order)
$100 million+		
Warrick	$205,490,213.00	Coal
Pike	133,932,278.00	Coal
$50-100 million		
Daviess	66,886,478.00	Coal, sand & gravel
Sullivan	55,802,744.00	Coal

$25-50 million

Vermillion	48,503,660.00	Clay & shale, coal, sand & gravel
Knox	40,772,555.00	Coal, crushed limestone, sand & gravel
Clay	38,237,220.00	Clay & shale, coal
Spencer	28,731,285.00	Coal

$5-25 million

Dubois	16,935,493.00	Coal
Greene	16,700,684.00	Coal, sand & gravel
Crawford	-C-	Crushed limestone
Hamilton	8,993,042.00	Crushed limestone, peat, sand & gravel
Martin	8,800,979.00	Coal, gypsum
Marion	8,608,985.00	Crushed limestone, sand & gravel
Lawrence	8,577,093.00	Crushed limestone, dimension limestone, dimension sandstone
Putnam	8,008,779.00	Clay & shale, crushed limestone, sand & gravel
Monroe	5,891,179.00	Crushed limestone, dimension limestone
Fountain	5,867,014.00	Coal, sand & gravel
Vigo	5,308,452.00	Coal, sand & gravel
Clark	5,050,323.00	Clay & shale, crushed limestone, sand & gravel

	1980		1981	
	Quantity	Value	Quantity	Value
Coal	30,096,022 tons	$662,112,484.00	29,146,453 tons	$675,614,781.00
Petroleum	4,977,581 bbls	174,993,499.00	4,721,396 bbls	174,278,000.00
Limestone, crushed	30,914,434 tons	92,104,486.00	25,042,037 tons	78,308,394.00
Sand and Gravel	20,036,338 tons	48,724,940.00	17,613,423 tons	44,802,259.00
Limestone, dimension	1,969,141 cu.ft.	6,971,873.00	1,658,207 cu.ft.	6,165,362.00
Peat	76,916 tons	1,390,400.00	104,975 tons	3,140,080.00
Clay and Shale	860,261 tons	1,633,212.00	654,361 tons	1,435,508.00
Natural gas	464,000,000 cu.ft.	626,000.00	357,000,000 cu.ft.	1,143,100.00
Undistributed (includes dimension sandstone, gypsum, marl, whetstones)		8,034,536.00		6,522,332.00
TOTAL		$996,591,430.00		$991,409,816.00
Value added for additional processing of dimension limestone, and manufacture of clay products and cement		$106,132,421.00		$ 92,661,839.00

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Hasenmueller, W. A., 1981, Directory of coal producers in Indiana: Indiana Geological Survey Directory, 74 pages, 18 figures.

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Patton, J. B., and Carr, D. D., 1982, The Salem Limestone in the Indiana building-stone district: Occasional Paper 38, 31 pages, 29 figures, 2 tables.

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Sullivan, D. M., Enochs, L. G., and Cazee, J. T., 1981, Well location map of Wells County, Indiana, showing total depth of wells: Petroleum Exploration Map 77A.

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Revised Petroleum Exploration Maps (as of December 31, 1981): 3A, 3B, and 3C (Warrick County); 4A, 4B, and 4C (Sullivan County); 5A and 5B (Vigo County); 13A, 13B, and 13C (Greene County); 14A and 14B (Clay County); 16A (Vermillion County); 21A, 21B, and 21C (Dubois County); 23, 23A, and 23C (Knox County); 24A (Monroe County); 25A (Lawrence County); 26, 26A, and 26C (Daviess County); 27A (Orange County); 28A and 28C (Crawford County); 30 and 30A (Harrison County); 35A (Morgan County); 39, 39A, and 39C (Spencer County); 40, 40A, and 40C (Perry County); 46A (Jennings County); 51, 51A, and 51C (Pike County); 52, 52A, and 52C (Vanderburgh County); 53, 53A, and 53C (Gibson County); 54, 54A, and 54C (Posey County); 55A (Steuben County); 58A (DeKalb County); 71A (Jasper County); 72A (Newton County); 74A (Miami County); 75A (Wabash County); 76 (Huntington County); 79 (Jay County); 81 (Delaware County); 86A (Dearborn County); 93A (Henry County); 94A (Hancock County); 95A (Decatur County); 96A (Shelby County); and 97A (Rush County).

Checked Without Revision Petroleum Exploration Maps (as of December 31, 1981): 12, 12A, and 12C (Martin County); 15A (Parke County); 17A (Fountain County); 18A (Owen County); 19A (Putnam County); 20A (Montgomery County); 22A (Jackson County); 29A (Washington County); 31A (Brown County); 32A (Bartholomew County); 33A (Hendricks County); 34A (Marion County); 36A (Johnson County); 37A (Tippecanoe County) 38A (Warren County); 41A (Benton County); 42A (White County); 43A (Carroll County); 44A (Clinton County); 45A (Boone County); 47A (Jefferson County); 48A (Scott County); 49A (Clark County); 50A (Floyd County); 56A (Lagrange County); 57A (Noble County); 59A (Allen County); 60A (Whitley County); 61A (Kosciusko County); 62A (Elkhart County); 63A (St. Joseph County); 64A (Marshall County); 65A (Fulton County); 66A (Cass County); 67A (Pulaski County); 68A (Starke County); 69A (LaPorte County); 70A (Porter County); 73A (Lake County); 80 (Blackford County); 82 and 82A (Grant County); 83A (Howard County); 84A (Switzerland County); 85A (Ohio County); 87A (Ripley County); 88A (Franklin County); 89A (Union County); 90A (Fayette County); 91A (Wayne County); 92A (Randolph County); 98A (Hamilton County); 99A (Madison County); and 100A (Tipton County).

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Hartke, E. J., 1982, Environmental geology of Grant County, Indiana -- an aid to planning: Special Report 23 (Environmental Study 17), 25 pages, 1 plate, 11 figures.

Hill, J. R., 1981, Some environmental geologic factors as aids to planning in Cass County, Indiana: Special Report 22 (Environmental Study 16), 30 pages, 15 figures, 2 tables.

Palmer, A. R., 1982, Fossils of Dresbachian and Franconian (Cambrian) age from the subsurface of west-central Indiana: Special Report 29, 12 pages, 2 plates, 2 figures.

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Special Unnumbered Publication

Hasenmueller, N. R., and Woodard, G. S., 1981, Studies of the New Albany Shale (Devonian and Mississippian) and equivalent strata in Indiana: viii + 100 pages, 40 figures, 15 tables.

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Hill, J. R., December 10, 1981, An evaluation of the new proposed sanitary landfill at Bedford, Indiana: 5 pages, 3 figures (for Jack Salsbery, Warren T. Hobson & Associates, Inc., Indianapolis).

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Shaver, R. H., May 24, 1982, Continuation of a geologic report on the problem of flood-plain erosion half a mile north of New Harmony, Indiana: 13 pages, 3 figures, 2 tables (to William J. Andrews, Indiana Department of Natural Resources).

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Ault, C. H., and Oak, L. C., 1982, Field trip to the Kentucky Avenue Underground mine of Martin Marietta Aggregates: Eighteenth Forum on Geology of Industrial Minerals Guidebook (mimeographed), Indiana Geological Survey-Department of Geology, Indiana University, 5 pages.

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Carr, D. D., and Murray, H. H., 1981, Introduction, Papers from symposium, "Industrial Minerals of the Upper Midwest": Geological Society of America Bulletin, v. 92, n. 9, p. 610.

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Shaffer, N. R., Ault, C. H., Carr, D. D., Fraser, G. S., and Hasenmueller, W. A., 1982, Map of Indiana showing locations of coal and industrial minerals: Indiana Geological Survey Miscellaneous Map.

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Ault, C. H., Harper, D., and Wright, M. A., Report to the NRC on the faulting project in southwestern Indiana; the New Madrid Study Group, April 28, 1982, West Lafayette, Indiana.

Ault, C. H., Sullivan, D. M., and Wright, M. A., Progress report to the NRC on faulting in southwestern Indiana, November 5, 1981, Cincinnati, Ohio.

Bleuer, N. K., and Fraser, G. S., Geology of the Wabash River Valley: at the Geological Society of America meeting in November, 1981, Cincinnati, Ohio.

Bleuer, N. K., and Fraser, G. S., Seminar on glacial geology: U.S. Geological Survey personnel from Indiana and Ohio in Indianapolis on March 10, 1982.

Bleuer, N. K., New evidences of mode of late glacial flow in Indiana and adjoining states: Glaciology Seminar at Ohio State University in Columbus on March 16, 1982.

Bleuer, N. K., Stratigraphy and style of Trafalgar (Wisconsinan) glaciations in central Indiana: North-Central Section, Geological Society of America at Purdue University on April 29, 1982.

Carr, D. D., Assessment of non-metallic resource potential: at a workshop sponsored by the National Academy of Sciences, April 27, 1982, Denver, Colorado.

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Fraser, G. S., Sand and gravel resources of the Wabash Valley: at the Eighteenth Forum on Geology of Industrial Minerals, April 15, 1982, at Bloomington, Indiana.

Fraser, G. S., Substrate control channel migration in the Ohio River near Evansville: at the Geological Society of America meeting, Cincinnati, Ohio, November, 1981.

Gray, H. H., Ice-marginal drainage patterns in southwestern Indiana: North-Central Section, Geological Society of America at Purdue University on April 29, 1982.

Hasenmueller, N. R., Resource assessment of the New Albany Shale: at the Eastern Oil Shale Symposium, Lexington, Kentucky, November 16, 1981.

Shaffer, N. R., Ault, C. H., and Carr, D. D., High-brightness limestones in Indiana, Indiana Academy of Science at Crawfordsville, Indiana, November 6, 1981.

Rexroad, C. B., Creationism and evolution: "Coffee and Conservation" group, First United Methodist Church, Bloomington, Indiana on January 10, 1982.

Rexroad, C. B., Creationism and evolution: Trinity Episcopal Church Sunday Forum, Bloomington, on November 22, 1981.

Rexroad, C. B., Classification of conodonts: Indiana University graduate class in micropaleontology, November 4, 1981.

Rexroad, C. B., Conodonts from the Everton Dolomite and St. Peter Sandstone in Indiana, for Indiana University graduate seminar in geobiology on February 24, 1982.

Rexroad, C. B., Creationism vs. evolution: Indiana University Geology Colloquium on April 19.

Rexroad, C. B. (with R. L. Ethington, University of Missouri and J. B. Droste, Indiana University), Conodonts from the Everton Dolomite and St. Peter Sandstone (Lower Middle Ordovician) in the subsurface of southwestern Indiana: North-Central Section, Geological Society of America at Purdue University on April 29.

Shaffer, N. R., Leininger, R. K., Ripley, E. M., and Gilstrap, M. S., Heavy minerals in New Albany Shale: Geological Society of America meeting at Cincinnati, Ohio, November 1, 1981.

Shaffer, N. R., Yates, M. G., and Ripley, E. M., Sulfur isotopes in pyrites in the New Albany Shale: at the Geological Society of America meeting, West Lafayette, Indiana, April, 1982.

Shaver, R. H., and Griest, S., Geometric and paleoecologic analysis of a Silurian reef complex near Celina, Ohio: for the Indiana Academy of Science meeting at Wabash College on November 6, 1981.

Shaver, R. H., Silurian stratigraphy: Appalachian Basin to the Midcontinent: Indiana University graduate class in stratigraphy on November 12, 1981.

Shaver, R. H., and Droste, J. B. (speaker), Middle Paleozoic paleogeographic of the Midwest: Symposium on "Late Pre-Cambrian-Paleozoic History of the Michigan Basin", Michigan Academy of Science at Kalamazoo on March 27.

Shaver, R. H., The Atokan Series in the Midwest--what the Morrowan and Desmoinesian Series are not: Symposium on "The Atokan Series and Its Boundaries", South-Central Geological Society of America, University of Oklahoma on March 29.

Shaver, R. H., (with J. A. Sunderman, Indiana University-Purdue University at Fort Wayne), Reef and interreef depths on the Silurian Wabash platform of northern Indiana: North-Central Section of Geological Society of America at Purdue University on April 30.

Wright, M. A., Ault, C. H., and Harper, D., Implications of structures in mines in southwestern Indiana: Geological Society of America meeting, West Lafayette, Indiana, April 29, 1982.

PROFESSIONAL ACTIVITIES AND COMMITTEES

The annual meeting of the Forum on Geology of Industrial Minerals was held April 14-16, 1982, on the Indiana University campus. More than 140 geologists and other professionals attended, and 17 reports on various aspects of construction materials, the theme of the Forum, were given at the meeting and reports written for the Proceedings of the Forum. Most of the organization and conducting of the meetings were done by members of the Coal and Industrial Minerals Section. Members of tthe Section on the Local Committee were: Don Carr, Vice Chairman; Curt Ault, Technical Program Chairman; Gordon Fraser, Finance Chairman; and Nelson Shaffer, Field Trip Chairman.

The objective of the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin is to confirm and establish correlations of coals and related rocks in the Illinois Basin and to promote a uniform nomenclature. Don Carr, Curt Ault, Walt Hasenmueller, and Henry Gray served on the committee this year. Members of the committee from Indiana, Illinois, and Kentucky prepared a report onn recommended Pennsylvanians correlations for submission to the AAPG Bulletin.

Don Carr was a member of the European Coal Trade Mission, headed by the Lt. Governor, to promote the use of Indiana coal overseas. He participated in the overseas presentation of the mission made in several foreign countries, June 4-19, 1982.

Don Carr was president of the American Institute of Professional Geologists--Illinois-Indiana Section through 1981 and arranged for its fall meeting in Bloomington on October 27, 1981. Sixty-five attendees were present at the afternoon technical session, which was chaired by Dr. Carr.

Gordon Fraser was elected President of the Great Lakes Section of the Society of Economic Paleontologists and Mineralogists after previously serving as Treasurer. He was active in helping publish the organization's news letter and organizing its field trips, short courses, and meetings.

Don Carr served on the Research Committee of the Interstate Mining Compact Commission.

Don Carr served on the Energy Resources Committee of the Interstate Oil Compact Commission.

Curt Ault served as a member of the Indiana Geological Survey Geologic Names Committee.

Don Carr served as chairman of the Nominating Committee of the Society of Mining Engineers, which prepared a list of officers for voting by the membership. He helped with scholarship awards from the Industrial Minerals Division and helped organize an industrial minerals session for the 1982 fall meeting in Hawaii. At the Dallas meeting, Don and Curt Ault presented a paper on underground limestone mining in Indiana, chich was approved for publication in the SME Transactions.

Don Carr was nominated as 2nd Vice President of the Geological Society of America--Coal Division, and according to rotation of offices, should be President when the Society meets in Indianapolis in 1983.

Gordon Fraser continues to organize the annual meeting of the Geological Society of America short course on applied organic geochemistry for the Great Lakes Section of the Society of Economic Paleontologists and Mineralogists.

Nelson Shaffer began making arrangements for the Symposium on stable isotopes and possible publication of its proceedings.

Don Carr arranged for a symposium on paleoclimatic controls on coal resources to be sponsored by the Coal Division.

Henry Gray served as chairman of the Geography and Geology Section of the Indiana Academy of Science on November 6.

Robert Shaver served as a member of the Presidential Advisory Committee, Society of Economic Paleontologists and Mineralogists.

Robert Shaver served as a member of the 1983 Indianapolis convention Committee, Geological Society of America.

Robert Shaver chaired the 1983 Geolgocial Society of America Field Trip Committee.

Robert Shaver served on the Nominating Committee of the North-Central Section of the Geological Society of America.

Gerald Carpenter developed oil and gas statistics for the joint American Association of Petroleum Geologists-American Petroleum Institute Committee of Drilling Statistics for Indiana which become part of the

national drilling statistics. Gerald attended the committee's annual meeting held in Calgary, Alberta Canada in June.

Stanley Keller is a member of the Potential Gas Committee. He develops potential gas reserve figures for Indiana for publication by the committee.

Gerald Carpenter, Dan Sullivan, Stanley Keller, Andrew Hreha, and Brian Keith are members of the Illinois Basin American Petroleum Institute Division of Production.

OUTSIDE PROFESSIONAL PUBLICATIONS

Don Carr continued to serve as Subject Editor for Industrial Minerals for Pergamon's Encyclopedia of Materials Science and Engineering. He edited 15 manuscripts during the year for the encyclopedia and maintained correspondence with Pergamon Press. Most of his work for the encyclopedia was completed.

Seventeen manuscripts were received for inclusion in the Proceedings of the Eighteenth Forum on Geology of Industrial Minerals by Gordon Fraser, Curtis Ault, and Don Carr. Curtis Ault and Gerald Woodard, editors of the Proceedings, completed review of the reports, and preparation of camera copy is continuing.

PUBLIC LECTURES

Nelson Shaffer gave a lecture on meteorites at the Spring Mill State Park on August 22, 1981.

Gordon Fraser gave three lectures in the Geology 501 class at Indiana University on shelf and near-shore sedimentation in September.

Nelson Shaffer gave a seminar talk on the potential of in-situ mining using microbial leaching to the Indiana University Geology Department Economic Geology seminar, September 29, 1981.

On October 20, Donald Eggert gave a talk to the Indiana-Kentucky Geological Society on contemporaneous channels and the Springfield Coal Member.

On October 28, Nelson Shaffer gave a talk on metals in the New Albany Shale at a seminar of the Geology Department at Indiana University.

Gordon Fraser gave two lectures to the Indiana University Geology 501 class on the sedimentology of braided streams in October.

John Patton presented a talk, "Brick by Brick - Stone by Stone" at the annual meeting of Hillforest Foundation at Aurora on November 19.

Curt Ault gave a talk, "Faulting in southwestern Indiana and its economic and tectonic implications", at Indiana Geologists in Indianapolis on January 13, 1982.

Gordon Fraser gave a lecture on the J. R. L. Allen model for meandering rivers to the Indiana University geology 690 class in January.

On February 15, Nancy Hasenmueller talked on oil-shale development of the New Albany Shale to local residents at Hope, Indiana. The meeting was sponsored by the Purdue Cooperative Extension Service.

Walt Hasenmueller gave a talk on coal resources of Dubois County at Jasper, February 2, to local residents. This talk was also sponsored by the Purdue Extension Service.

Walt Hasenmueller gave a talk on coal resources of eastern Clay County to some property owners at Clay City, March 2.

On March 4, Nelson Shaffer spoke to an Indiana University geochemistry seminar on sulfur isotopes in the New Albany Shale.

On March 10, Gordon Fraser gave lectures on proglacial sedimentation to U. S. Geological Survey personnel at Indianapolis.

On March 19, Nelson Shaffer gave a lecture with handouts to a class in hydrology at Indiana University about hydrogeochemical exploration.

Nelson Shaffer lectured to an economic geology class about industrial minerals on March 29 and 31, 1982.

Nelson Shaffer gave a talk on meteorite and Mississippi-Valley-type ores at Ball State University in Muncie on April 1.

Nelson Shaffer gave a talk on industrial minerals to an economic geology class at Indiana University on April 2.

Nelson Shaffer lectured to a paleontology class at Indiana University on April 7 on bacteria and fractionation of sulfur isotopes.

Nelson Shaffer gave a talk to a hydrology class at Indiana University on isotope studies of groundwater on April 19.

Nancy Hasenmueller gave a talk, "The stratigraphy of the New Albany Shale in southeastern Indiana", at a meeting sponsored by the Indiana Farm Bureau, April 24, at Henryville in Clark County.

Gordon Fraser gave a lecture on "Substrate control of channel migration, Ohio River" at a Survey colloquium in May.

John Patton presented a talk "Brick by Brick - Stone by Stone" at the spring meeting of Sigma Xi at Indiana State University on May 4.

On June 21, Nelson Shaffer gave an informal program on minerals and rocks to two groups of Girl Scouts.

Gerald Carpenter presented a talk to an adult agriculture-economics study group on "The Petroleum Potential of Orange County" at Paoli on February 1. A similar group at Hope was addressed on the "Petroleum

Potential of Bartholomew County" on February 15 at which meeting Nancy Hasenmueller spoke on oil shale of southeastern Indiana and its petroleum potential. Yet a third similar group was addressed on February 23 by Gerald at Lafayette on the petroleum potential of Tippecanoe County and vicinity. The series of talks were arranged by the Purdue agriculture extension office in cooperation with the county agriculture agents of the various counties in response to oil and gas leasing occurring in the areas of interest.

Gerald Carpenter presented a talk on the drilling and leasing activity in Indiana during 1982 to members of the Independent Oil Producers Association at the Oak Meadow Country Club in Evansville on May 14.

Brian Keith presented a talk to a meeting of the Indiana Chapter of the International Right-of-Way Association on June 2.

ATTENDANCE AT PROFESSIONAL MEETINGS

Henry Gray served and attended two meeting as a member and secretary of the Tri-State Committee on Pennsylvanian Correlations in the Illinois Basin, in Evansville, including field trip, and Henderson, Kentucky.

Don Carr, Walt Hasenmueller, Curt Ault, and Henry Gray attended a meeting of the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin in Urbana, Illinois on July 7, 1981.

Carl Rexroad and Samuel Frushour attended the International Congress of Speleology at Bowling Green, Kentucky on July 18-25, 1981.

Nelson Shaffer attended a mineral show at South Bend on July 24 and attended the Midwest Federation mineral show at Bedford on July 31.

Don Eggert attended part of a conference of the American Institute of Biological Sciences in August.

Walt Hasenmueller and Nelson Shaffer attended the meeting of Indiana Geologists in Indianapolis on September 9, 1981.

Walt Hasenmueller attended the meeting of the Indiana Mining and Technical Society in Vincennes, September 17.

Nelson Shaffer attended a mineral show of the 500 Earth Science Club at Greenfield, September 12.

John Patton participated in a meeting of the Indiana Energy Development Board in Indianapolis on September 21.

John Patton attended a historic preservation conference at South Bend on September 25-26.

On October 1, Walt Hasenmueller and Don Carr attended a meeting of the Indiana Coal Coucil in Vincennes.

On October 11, Nelson Shaffer attended a mineral show of the Kyana Geological Society in Louisville, Kentucky.

John Patton attended a reception and dinner at the annual meeting of the Indiana Limestone Insitute of America on October 13.

On October 12-13, Walt Hasenmueller, Curt Ault, Don Eggert, and Henry Gray attended the meeting of the Tri-State Correlation Committee and field trip in Henderson,Kentucky.

On October 13, Don Carr attended the fall meeting of the Indiana Limestone Institute of America.

On October 14, Maurice Biggs, Dick Leininger, and Don Carr attended the formal opening of the new Applied Coal Research Laboratory at the Illinois Geological Survey.

On October 21-24, Don Carr attended the American Institute of Professional Geologists meeting in Williamsburg, Virginia.

Don Carr organized the fall meeting of the Illinois-Indiana Section--American Institute of Professional Geologists in Bloomington October 27 and was chairman of the technical session on "Communicating with other Professions". Curt Ault, Nancy Hasenmueller, Denver Harper, Walt Hasenmueller and Nelson Shaffer also attended the meeting.

John Patton participated in a meeting of the Illinois-Indiana Section of American Institute of Professional Geologists in Bloomington on October 27.

John Patton attended the annual meeting of the Geological Society of America in Cincinnati on November 1-3. He also participated in a meeting of the Stratigraphic Code Revision Committee and the North American Commission on Stratigraphic Nomenclature.

Don Carr, Curt Ault, Nelson Shaffer, Gordon Fraser, and Michele Wright attended the Geological Society of America meeting at Cincinnati, Ohio on November 2-5.

John Patton attended the annual meeting of the Indiana Academy of Science at Crawfordsville on November 5-7.

Nelson Shaffer, Walt Hasenmueller, Henry Gray, and Don Carr attended the Indiana Academy of Science meeting at Crawfordsville, November 6.

Don Carr attended the meeting of the Society of Mining Engineers in Denver, November 16-18.

Nancy Hasenmueller attended the Eastern Oil Shale Symposium in Lexington, Kentucky, November 16-17.

Walt Hasenmueller attended the Indiana Mining and Technical Society meeting in Vincennes, November 19.

Don Eggert attended the Symposium on Surface Mining, Hydrology, Sedimentology, and Reclamation in Lexington, Kentucky, December 9 and 10.

John Patton attended meeting of the Interstate Coal Task Force in Indianapolis on February 10.

Walt Hasenmueller attended the Mining and Technical Society meeting in Vincennes, February 18.

Don Carr attended the Society of Mining Engineers Annual Meeting in Dallas, Texas, February 14-17 and conducted the business of the Chairman of the SME Nominating committee, February 15.

On February 10, Don Carr, Dick Leininger, and John Patton attended the meeting of the Interstate Coal Task Force at Indianapolis.

John Patton participated in a meeting of the Technical Advisory Committee, Solid Waste Facility Siting Authority on February 19.

Don Carr and John Patton attended the annual meeting of the Indiana Mineral Aggregates Association, March 11-13.

John Patton participated in a meeting of the Stratigraphic Code Revision Committee of the North American Commission on Stratigraphic Nomenclature in Carmel, California on March 14-18.

On March 23, Don Carr and Dick Leininger attended a meeting of the Indiana-Kentucky Geological Society.

Walt Hasenmueller and Denver Harper attended the Indiana Coal Mining Institute in Owensboro, Kentucky, March 25-27.

On March 29, Curt Ault, Don Carr, Don Eggert, Nancy Hasenmueller, Dan Sullivan, and Stan Keller attended a seminar on well logging sponsored by Schlumberger.

Nelson Shaffer attended mineral shows at Cincinnati, April 4, at Richmond, April 23, and at Columbus, Ohio, April 24.

John Patton, Don Carr, Curt Ault, Gordon Fraser, Nelson Shaffer, Nancy Hasenmueller, and Walt Hasenmueller attended the Eighteenth Annual Forum on Geology of Industrial Minerals April 14-16 at Bloomington.

John Patton participated in a meeting of Committee C-18 Natural Building Stones, American Society for Testing and Materials at Oberlin, Ohio on April 25-27.

John Patton, Michele Wright, Nancy Hasenmueller, Gordon Fraser, Nelson Shaffer, Curt Ault, Denver Harper, and Don Eggert attended the North-Central Section meeting of the Geological Society of America, April 28-May 1 at Purdue University.

On April 29, Don Carr attended the annual meeting of the Indiana Limestone Institute of America.

On April 27, Don Carr attended the workshop on assessment of resource potential of public lands sponsored by the National Academy of Sciences, Denver, Colorado.

Nelson Shaffer attended a conference and field trip on sedimentology and paleontology of mid-continent black shales in Cleveland, Ohio, May 7 and 8.

Ed Hartke attended a U.S. Geological Survey-sponsored Indiana Water Resources Workshop in Indianapolis on May 12.

Don Eggert, Denver Harper, and Nelson Shaffer attended a seminar on paleobotany and interpretation of Pennsylvanian environments at Urbana, Illinois, June 14.

Nelson Shaffer attended a mineral show at Terre Haute on June 12.

Ed Hartke attended a symposium of Indiana Water Resources Association in South Bend on June 9-11.

Robert Shaver attended the Geological Society of American-sponsored Decade of North America Geology Workshop at the University of Oklahoma on June 11-13.

John Hill attended a meeting of the Technical Advisory Committee of the Solid Waste Facility Siting Authority for the State of Indiana in Indianapolis.

Carl Rexroad attended a discussion session sponsored by the U. S. Department of Agriculture (Stabilization and Conservation Service) on the sedimentation problem in Spring Mill Lake.

Dan Sullivan and Stanley Keller attended the annual meeting of the Independent Oil Producers Association at Mt. Vernon, Indiana.

Dan Sullivan and Gerald Carpenter attended the September meeting of the Indiana-Kentucky Geological Society in Evansville.

Stanley Keller, Brian Keith, and Gerald Carpenter attended the regional meeting of the American Institute of Professional Geologists held at the Geological Survey's facilities in October.

Stanley Keller attended the October meeting of the Indiana-Kentucky Geological Society in Evansville.

Gerald Carpenter and Stanley Keller attended the November meeting of the Indiana-Kentucky Geological Society in Evansville.

Dan Sullivan attended a meeting of the Indiana Geologists in Indianapolis at which Curtis Ault reported on faulting in southern Indiana.

Dan Sullivan and Gerald Carpenter attended the January meeting of the Indiana-Kentucky Geological Society in Evansville.

Brian Keith attended the annual meeting of the American Petroleum Institute Production Division Illinois Basin Chapter held in Evansville during April.

Dee Rarick, Dan Sullivan, and Gerald Carpenter attended the annual Illinois Oil and Gas Association meeting in Mt. Vernon on June 9. The Survey display concerning the Trenton oil field was set up at the meeting as an invited exhibit.

Gerald Carpenter attended the annual American Association of Petroleum Geologists meeting held in Calgary, Alberta Canada, June 27-30. He also attended the meeting of the AAPG House of Delegates as a delegate representing the Indiana-Kentucky Geological Society.

Dan Sullivan attended the annual meeting of the Kentucky Oil and Gas Association in Owensboro, Kentucky on June 17-18.

Brian Keith and Stan Keller attended the June 22 meeting of the Indiana-Kentucky Geological Society in Evansville to hear a talk by Tom Partin of Beeson Oil Producers.

Brian Keith attended the national Geological Society of America meeting held in Cincinnati, Ohio. Dan Sullivan attended a meeting of the New Madrid Study Group held in conjunction with the GSA meeting.

Gerald Carpenter presented a talk, "Oil Potential of Western Morgan and Eastern Putnam Counties" to an adult agriculture-economics study group at Eminence on January 4.

Dan Sullivan and Gerald Carpenter attended the December meeting of the Indiana-Kentucky Geological Society on December 3 in Evansville. Gerald participated in a panel discussion and question and answer session relative to the oil industry in Indiana.

Stan Keller and Dan Sullivan attended a logging seminar presented by Schlumberger personnel dealing with standard and new logging techniques for the Illinois Basin.

FIELD TRIPS

On July 21, Don Carr, Dick Leininger, Gerald Carpenter, Nancy Hasenmueller, and Mark Milliken of Mobil Oil examined exposures of New Albany Shale in southeastern Indiana.

Don Eggert helped Bill DiMichele lead a paleobotany field trip, August 8-15.

John Patton conducted a field trip in the building stone quarry district in connection with the annual meeting of the American Institute of Biological Sciences on August 16.

Henry Gray, with Marion Jackson of Indiana State University, conducted a field trip on August 16 of Knobstone Trail in Clark County for the American Institute of Biological Science.

Gordon Fraser attended the Eleventh Annual Field Conference of the Great Lakes's Section of the Society of Economic Paleontologists and Mineralogists in September.

Robert Shaver, on September 19, conducted a field trip of the Silurian reef at Delphi, Indiana for geologists and geophysicists of Shell Oil Company, Houston.

Don Eggert showed Andrew Scott, University of London, exposures of the Springfield Coal Member and associated rocks at the Peabody Lynnville Mine in October.

On October 17, Robert Shaver conducted a field trip of Silurian reefs of the Indiana-Ohio border area, a field trip with stratigraphic, paleoenvironmental, geometric, paleontologic, and philosophic samplings for the Ohio Geological Society, of Columbus, Ohio and a class of Wright State University students.

In February, Nelson Shaffer and Gordon Fraser made reconnaissance visits and descriptions in preparation for several Geological Society of America field trips in 1983.

Don Eggert led an informal field trip to the Lynnville Mine, Eby Pit, for Illinois and Indiana Survey geologists and Peabody and AMAX geologists. Don Carr, Walt Hasenmueller, Nancy Hasenmueller, and Nelson Shaffer attended the trip which was conducted in February.

Denver Harper and Don Eggert conducted a field trip to the Chinook Mine, a subsidence site, and the Roaring Creek fossil locality for a group of Dennison College students from Ohio in March.

John Patton conducted a field trip on March 6 in the building stone district for a ladies group from the Cincinnati Museum of Natural History.

At the North-Central Geological Society of America meeting in April, Gordon Fraser helped conduct a field trip to study the geomorphology and glacial history of the Great Bend area of the Wabash Valley.

Henry Gray, assisted by R. L. Folk, University of Texas and Lee Suttner, Indiana University Department of Geology, led a field trip on sandstone of southern Indiana on April 1, for Indiana University graduate sedimintation seminar group.

Nelson Shaffer, Gordon Fraser, and Curt Ault lead a field trip to the Martin Marietta underground mine and the American Aggregates sand and gravel pit at Indianapolis for the Forum, April 14.

John Patton, Don Carr, and Nelson Shaffer led a Forum field trip April 16 to the Bloomington-Bedford dimension-stone district and to the U.S. Gypsum mill and underground gypsum mine at Shoals.

Robert Shaver, with the assistance of Jack Sunderman of Indiana University-Purdue University at Fort Wayne, conducted a field trip to Silurian reefs at Delphi and Pipe Creek Jr. Quarry, Indiana, with emphasis

on the question of deep vs. shallow water for the North-Central Section of the Geological Society of America meeting at Purdue University.

On May 1, 1982, Ned Bleuer and Gordon Fraser conducted a field trip, with the assistance of W. Melhorn of Purdue University, on geomorphology and glacial history of the Great Bend area of the Wabash Valley, Indiana, for the North-Central Section, Geological Society of America meeting at Purdue University.

On May 22-23 Ned Bleuer participated in the Midwest Friends of the Pleistocene field trip at Prairie du Chien, Wisconsin.

REVIEWS

Gordon Fraser reviewed a paper on the St. Peter Sandstone for the Journal of Sedimentary Petrology in July.

In November, several members of the Coal and Industrial Minerals Section reviewed the manuscript, "The mineral industry of Indiana", by James J. Hill, U.S. Bureau of Mines.

Gordon Fraser reviewed a National Science Foundation proposal on application of sedimentological models by hydrogeology in May.

Nelson Shaffer reviewed a paper on metal content of western black shales for the American Institute of Mining and Metallurgical Engineers volume on unconventional mineral resources in May.

During the year, Curt Ault reviewed 16 papers to be included in the Proceedings of the Forum on Geology of Industrial Minerals.

Gordon Fraser reviewed an M.S. thesis on sedimintology of the Lower Fountain Formation, Colorado; an M.S. thesis on sedimentology of the Whitewater River terraces, Indiana; and a manuscript on marl in Indiana.

Gordon Fraser and Curt Ault reviewed the Indiana portion of a U.S. Bureau of Mines map of aggregate reserves in the United States in June.

Nelson Shaffer reviewed a paper for the American Institute of Mining and Metallurgical Engineers in June.

During the year, Don Carr reviewed and edited 17 manuscripts for the Pergamon Encyclopedia of Materials Science and Engineering.

Ned K. Bleuer participated in the U.S. Department of Agriculture Soil Conservation soils review for Warren and Tipton Counties.

Henry Gray served as reviewer of parts of the new stratigraphic code, auspices of American Commission on Stratigraphic Nomenclature.

Carl Rexroad served as reviewer for the Journal of Paleontology.

NEWS RELEASES

A news release from the Indiana University News Bureau on Don Eggert's study of slurry ponds was carried in a number of Indiana newspapers in July.

A July news release from the Indiana University News Bureau on Don Eggert's slurry project was published in numerous Indiana newspapers in September.

Gordon Fraser was the subject of a news release on economic aspects of glaciation in Indiana in May.

NEWSLETTERS

Coal and Industrial Minerals Newsletter No. 7 was mailed to Indiana mineral producers and interested parties in January. Items for the newsletter were contributed by many members of the Section.

MISCELLANEOUS ACTIVITIES

Henry Gray wrote copy for the newspaper series "The Hoosier State Beneath Us".

Henry Gray served on the Geological Survey's Geologic Names Committee.

Henry Gray served as chairman of the Geological Survey's committee on production of a single sheet bedrock-geology map of Indiana.

Henry Gray prepared a display for the new Patoka Reservoir Interpretive Center.

Henry Gray collaborated with State Park personnel to prepare a TV script on "Standing Rocks".

John Hill organized the Survey's colloquium series.

Ed Hartke helped organize a workshop by Indiana Hoosier Heartland Commission concerned with solid waste handling in Indianapolis on June 17.

Ed Hartke served as the Geological Survey's illustrations editor.

Carl Rexroad prepared copy for two newspaper panels in the series "The Hoosier State Beneanth Us".

Carl Rexroad and Robert Shaver served as host to Becky Ohlmansiek, as a student intern from Hanover College for four weeks, May 1982.

Carl Rexroad hosted T. B. H. Jenkins, a conodont specialist, from the University of Sydney in Australia for three days to discuss Carboniferous faunas.

Robert Shaver chaired the Geological Survey's Geologic Names Committee.

Brian Keith was interviewed by WTTV (Channel 4) on June 25, in connection with a story on the Trenton Field.

John Patton hosted James Hill of the U. S. Bureau of Mines, Pittsburgh, for a visit to the Geological Survey on September 22.

John Patton and Dee Rarick hosted the Evansville Junior Rock Club on February 20 for several brief talks and a tour of the facilities.

Nelson Shaffer judged 4H fair exhibits for the Marion County Fair on August 6 and for the State Fair on August 15.